remain unchanged. This means that the dehydrogenase system is saturated with substrate during the whole period of metamorphosis. From the experiments reported here, it is clear that the substrate dehydrogenase system of *Drosophila* pupae undergoes quantitative changes during metamorphosis, which run parallel with those observed earlier in the oxygen-transferring system and which are manifested in the oxygen consumption of the pupae in different stages.

Alexander Wolsky
Hungarian Biological Research Institute,
Tihany, Lake Balaton, Hungary

OZONIZATION OF o-XYLENE AND 1,2,4-TRIMETHYLBENZENE[1]

Levine and Cole[2] found that *o*-xylene on ozonization affords products evidently arising from both of the two possible Kekulé forms of the hydrocarbon, but they presented no data concerning the yields of the three substances which they isolated. A reinvestigation of this reaction in our laboratory from the analytical point of view has been completed and will be described in detail in a paper which is being prepared for publication in the *Recueil des Travaux Chimiques des Pays-Bas*. As noted in a preliminary report of some of the experiments,[3] our method of following the course of the reaction consists in converting the products of ozonization into the oximes and determining the composition of the oxime mixture by a special analytical method.

If each of the two Kekulé forms contributes 50 per cent. to the structure of *o*-xylene, there should be formed 1 mole of dimethylglyoxal, 2 moles of methylglyoxal and 3 moles of glyoxal from 2 moles of *o*-xylene. We have transformed these decomposition products into the corresponding oximes and obtained the total oxime mixture in yields of from 20 to 25 per cent. of the theoretical amount calculated on *o*-xylene. The above theoretical ratio of the free carbonyl compounds would correspond to an oxime mixture of the following composition: dimethylglyoxime, 20 per cent.; methylglyoxime, 35 per cent.; glyoxime, 44 per cent. As a mean of six ozonization experiments, we found the ratio: dimethylglyoxime, 20.7 per cent.; methylglyoxal, 34.2 per cent.; glyoxime, 44 per cent. The accordance with the theoretical values seems better than it actually is, because the separate experiments show deviations of from 3 to 7 per cent. from the theoretical values. Considering the experimental difficulties, the accordance between experiment and theory is satisfying.

We have also investigated the ozonization of 1,2,4-trimethylbenzene. In this case, if the two resonating Kekulé forms each contribute 50 per cent. to the structure of the hydrocarbon, 2 moles of 1,2,4-trimethylbenzene should provide 1 mole of dimethylglyoxal, 4 moles of methylglyoxal and 1 mole of glyoxal, and the composition of the mixture of oximes should be: dimethylglyoxime, 18.9 per cent.; methylglyoxime, 66.7 per cent.; glyoxime, 14.4 per cent. As a mean of two ozonization experiments, we found the following percentages: dimethylglyoxime, 17.9 per cent.; methylglyoxime, 66.2 per cent.; glyoxime, 14.2 per cent. The accordance with the theoretical ratio is very good. In this case the quantity of oximes recovered amounted to 15 per cent. of the theoretical yield.

J. P. Wibaut
P. W. Haayman
Laboratorium voor Organische-Scheikunde,
Universiteit, Amsterdam

[1] This communication is constructed from data sent to me by Professor J. P. Wibaut in a letter of February 24, 1941, with the request that I arrange for its publication in Science. Professor Wibaut states, "I would appreciate very much if our results could be made available to American scientists in this way, as it may take some time before our complete paper will be published and even then it may not be available to the chemists in your country."—L. F. Fieser, Harvard University.

[2] A. A. Levine and A. G. Cole, *Jour. Am. Chem. Soc.*, 54: 338, 1932.

[3] J. P. Wibaut and P. W. Haayman, *Nature*, 144: 290, 1939.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

PRESERVATION OF BIOLOGICAL SPECIMENS WITH ISOBUTYL METHACRYLATE POLYMER

During the last few years several articles have been published describing various methods of preserving biological material by the methacrylate resins. Dr. J. H. Hibben[1] described a method of allowing the plastic to polymerize around the object to be preserved. Dr. H. G. Knight[2] called attention to the expense and difficulties of this method and Professor E. C. Cole[3] mentioned the possibility of imbedding objects in a solution of methyl methacrylate polymer dissolved in chloroform, but stated that he did not get satisfactory results.

Some months ago while attempting to preserve the color patterns of *Chorthippus longicornis* for genetic studies, the writer tried dipping the grasshoppers in a solution of isobutyl methacrylate polymer dissolved in toluene. The grasshoppers were first injected with various preservatives, pinned and then dipped in a solution containing 10 gm of the polymer to 100 cc of toluene, and allowed to dry. By repeated dippings

[1] J. H. Hibben, Science, 86: 247–248, 1937.

[2] H. G. Knight, Science, 86: 333–334, 1937.

[3] E. C. Cole, Science, 87: 396–398, 1938.

a coat approximately 1/16 of an inch thick was placed on the insects. When the abdomen was injected with 2 per cent. formaldehyde there was a slight fading, but recently, at the suggestion of Dr. C. E. McClung, ordinary white Karo syrup has been injected into the abdomen and so far there has been no fading. Every color is life-like and natural. As the methacrylate resin dries, however, there is a slight shrinkage. Wings of grasshoppers may be pinned out and painted with the resinous solution, adding successive coats until the desired thickness is obtained. Each coat must be thoroughly dry before the next coat is applied or the succeeding coat will soften the previous coat and allow the wing to fold. The wings may be allowed to dry for two or three days in a stretched position and then painted or they may be painted immediately after stretching if due care is taken to prevent the wings from being cemented to the stretching board or pins. In order to do this, best results were obtained by painting the dorsum of the body and the medial halves of the superior surfaces of the wings, allowing these areas to dry and then painting the lateral halves of the superior surfaces. After that coat was dry the ventral surfaces of the body and wings were painted. Then alternate coats were applied to the dorsal and ventral surfaces until they had a coating about one sixteenth of an inch thick.

Butterflies have been preserved in this manner. Except for the fact that the opaque scales are rendered translucent, the color pattern is preserved perfectly, and they may be examined with almost complete disregard for their fragility; in fact, several of the butterflies have been worn as ornaments, their glass-like finish giving them the appearance of imitations.

Frogs up to six inches in length have been preserved by dipping them in the resinous solution. Best results have been obtained by injecting the coelomic spaces and the muscles of the thigh and calf of the frog with a solution of sodium benzoate (one part saturated solution of sodium benzoate to three parts distilled water), then soaking them for fifteen minutes in a 2 per cent. formaldehyde solution before dipping them in the methacrylate solution. If the frogs are alternately dipped and dried until they have a coating from one sixteenth to one eighth of an inch thick there is no appreciable shrinkage. Good results have also been obtained by using 2 per cent. formaldehyde for injection purposes.

Each particular kind of material has to be treated in a manner suitable for its own needs. Leaves dried under pressure for two days and then dipped in this plastic solution have kept their color without distortion. Furthermore, fragile bones soaked in a solution of isobutyl methacrylate polymer have been strengthened until they can be handled without undue danger of damage.

M. D. WHEATLEY
THE STATE UNIVERSITY OF IOWA

A SIMPLE IMPROVEMENT IN THE FROG WEB CIRCULATION DEMONSTRATION

So often is the demonstration of the circulation in the web of the frog's foot used in biology classes that a simple improvement in the usual technique is worthy of mention here.

Recently we found it necessary to take photomicrographs of the melanophores in the frog web to record changes in size and shape. In order to produce a plane field such that the edges of the preparation would be in focus simultaneously with the center the idea was conceived of using a small plate of glass placed under the web between two toes. An ordinary microscope slide was cut into triangles, the apices of which were angles varying from 40° to 60°. By cutting diagonally across the slide these triangles had an altitude of one inch. The sharp edges were then rubbed smooth on a piece of emery cloth.

After the frog's toes were spread apart in the usual manner across an opening in the frog board a glass triangle was slipped between two toes and under the web. The glass triangle adheres tightly to the lower surface of the web once it comes in contact with it and the result is a plane surface which lends itself ideally for microscopic observation. Photomicrographs can be made of an area of the web with the entire optical field in focus. Observations of the blood flow are greatly improved. Also it has been found that the web does not become too dry if left in this condition for at least an hour which obviates adding water to the surface which in turn changes the focus of the microscope.

The simple addition of a glass triangle (which is very easily made) so improves the aspect of the web circulation that it is well worth trying by any one having to set up such a preparation.

WM. A. HIESTAND
PURDUE UNIVERSITY

BOOKS RECEIVED

BRANSON, E. B. and W. A. TARR. *Introduction to Geology*. Second edition. Pp. ix + 482. 447 figures. McGraw-Hill. $3.75.
CROSS, J. C. *An Introduction to Biology*. Pp. xviii + 507. 331 figures. Mosby. $1.90.
HOGG, JOHN C. and CHARLES L. BICKEL. *Elementary General Chemistry*. Pp. ix + 603. Illustrated. Van Nostrand. $2.12.
LYNN, ELDIN V. *Organic Chemistry; with Applications to Pharmacy and Medicine*. Pp. 410. Lea and Febiger. $4.50.
QUINE, WILLARD V. O. *Elementary Logic*. Pp. vi + 170. Ginn. $2.25.
TURNER, C. E. and ELIZABETH MCHOSE. *Effective Living*. Pp. x + 432. 164 figures. Mosby. $1.90.